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Review

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Exercise in head and neck cancer: review of the last 5 years

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ABSTRACT

Head and neck cancers (HNC) is a significant global health issue with increasing incidence and mortality rates. Physiotherapy in HNC is crucial for managing post-treatment challenges, reducing functional limitations, improving quality of life, and achieving maximum physical independence. This review examined full-text articles published between 2019 and 2024 on PubMed using keywords related to head and neck neoplasms, exercise, and rehabilitation. Out of sixteen accessed articles, eleven met the inclusion criteria. The reviewed studies primarily focused on supervised aerobic, and resistance exercises post-surgery. Aerobic exercise training did not change heart rate or aerobic endurance in participants before and after treatment. However, the control group in studies showed significant decreases in these parameters. This highlights the importance of aerobic exercise during chemotherapy.. Muscle strength exercises reported significant increases in overall muscle strength and positive changes in fatigue levels and quality of life in the exercise groups. Stretching exercises were performed in studies, replacing warm-up and cool-down periods. Qi-gong exercises administered to HNC patients resulted in significant improvements in quality of life, sleep quality, and cancer-related fatigue. The limited number of exercise studies in HNC highlights the need for more research. The reviewed studies demonstrate the importance of incorporating supervised exercise in the rehabilitation of HNC patients, particularly to mitigate the side effects of chemotherapy. Future research should explore home exercise programs and telerehabilitation to accommodate patients unable to participate in supervised exercise programs. Exercise plays a critical role in the rehabilitation of HNC patients, improving physical function, reducing fatigue, and enhancing quality of life, thus emphasizing the need to incorporate structured exercise programs into HNC treatment plans to optimize patient outcomes.

Keywords: Head and neck neoplasms, rehabilitaton, exercise

INTRODUCTION

Head and neck cancers (HNC) encompass a group of cancers that include the larynx, oral cavity, oropharynx, hypopharynx, nasopharynx, maxillary antrum, other paranasal sinuses, nasal cavity, salivary glands, and middle ear cancers, as well as their subtypes. In Turkiye, HNC is the 6th most common cancer in men and 11th in women. According to the Global Cancer Observatory (GLOBOCAN) 2020 data, 870,000 new cases of HNC are diagnosed annually, with 440,000 deaths reported. The incidence of HNC is increasing, with projections estimating 1.08 million new cases per year by 2030.[1]

Etiologically, tobacco and alcohol use, occupational, ionizing radiation, and viral exposures are significant risk factors. Tobacco-derived carcinogens and chronic heavy alcohol consumption are major global risk factors for HNC. In recent years, Human papilloma virus (HPV) is the most common cause of oropharyngeal cancer in Western countries, while Epstein-barr virus stands out as another factor playing a role in nasopharyngeal carcinomas.[2]

Treatment options for HNC vary based on the cancer type and stage, including surgery, radiotherapy, and chemotherapy, either alone or in combination[3]. Recently, targeted therapy,[4] immunotherapy,[5] and photodynamic therapy[6] have been introduced. Treatment choices consider tumor size, location, stage, pathology, patient's life expectancy, functionality, and cosmetic factors.[7] Each treatment modality affects patients' functional and aesthetic capacities, highlighting the importance of rehabilitation.

In many HNC cases, surgery is the primary treatment. Modified radical neck dissection is the gold standard when neck lymph nodes are involved. Although radiotherapy is a complementary treatment modality, studies show that with advancing technology, radiotherapy can control tumor growth and spread, and in specific tumors, it can be used as a standalone medical agent. The role of chemotherapy alone in HNC is uncertain; however, when combined with radiotherapy for advanced tumors, it effectively controls the tumor. While other treatments usually have localized

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effects, chemotherapy's systemic effects also reduce its frequency of use.[8]

Physiotherapy in Head and Neck Cancers

Physiotherapy in HNC is crucial in managing post-treatment challenges, reducing functional limitations, improving quality of life, and achieving maximum physical independence. HNC treatments can cause complications that necessitate physiotherapy and rehabilitation, including posture disorders, limited joint range of motion, trismus, respiratory problems, swallowing difficulties, dry mouth, facial paralysis, hearing problems, lymphedema, cosmetic issues, pain, fatigue, sleep disorders, and psychological problems.[9]

Rehabilitation focuses on neck joint range of motion, shoulder functions, posture, and respiratory mechanics. Interventions in these areas can significantly improve patients' quality of life. Common post-treatment complications like shoulder movement restrictions negatively impact daily activities. Postural deformities and reduced respiratory functions can adversely affect both physical and psychological health. Specific interventions, such as improving shoulder mobility, correcting posture, and increasing respiratory capacity, are essential. The broad application range of physiotherapy includes special exercise programs, lymphedema management, and facial paralysis rehabilitation. However, more knowledge and awareness are needed regarding the effectiveness and standard application methods of these rehabilitation techniques.[10]

Aerobic, resistance, stretching and Qi-gong exercises are utilized in HNC patients. This review was conducted to emphasize the critical need for including exercise in the rehabilitation process for HNC patients by highlighting recent advancements and findings in current literature.

METHODS

Using keywords "head and neck neoplasms or neck dissection and exercise or rehabilitation," full-text articles published between 2019-2024 in PubMed were reviewed. Keywords were selected from the medical subject headings (MeSH) database. Sixteen articles were accessed and reviewed in detail.

Of the reviewed articles, two focused on swallowing, one on trismus-related devices, one lacked exercise, and one was a study design, and 11 articles[11-21] focusing on exercise interventions and its effectiveness included in the review.

RESULTS

Most exercise interventions in HNC focus on supervised aerobic[11,15,18,20,21] and resistance[11,12,15-21] exercises post-surgery. Ten studies[11-13,15-21] involved supervised exercise interventions, primarily aiming to increase aerobic capacity and muscle strength. One study[12] recommended maintaining physical activity levels above 150 minutes weekly, another[19] included range of motion exercises and NMES. Table.

Aerobic Exercises

In five studies where aerobic exercise training was conducted,[14,15,18,20,21] it was noted that there was no reduction in the pre-treatment/post-treatment values of heart rate and aerobic endurance parameters among participants who underwent exercise training. However, a significant decrease was observed in the control group. These studies particularly emphasized the necessity of providing aerobic exercise in cases where chemotherapy is administered. In a study by Van Vulpen et al.,[11] instead of cardiopulmonary outcomes, exercise barriers encountered during aerobic and resistance exercises were investigated, and participants reported facing the most difficulties due to lack of physical fitness and transportation issues.

It has been determined that studies involving aerobic exercise training typically span between 8 to 15 weeks (average of 11 weeks), with 2 to 5 sessions per week (average of 3 sessions), and each session lasting 20 to 50 minutes (average of 28.33 minutes) of aerobic exercise.

Exercises to Increase Muscle Strength

In nine studies,[11,12,14-16,18-21] interventions were implemented to enhance muscle strength. Although results focusing on different muscle groups were published, a significant increase in overall muscle strength was reported. Additionally, it was emphasized that there were positive

Table. Included studies

Author (year)	Number of participants (intervention/ control)	Exercise modality	Intervention time	Supervised	Duration	CT	RT
van Vulpen Jonna K. (2023)[11]	120 (61/59)	Aerobic+resistance	Post-surgery	Supervised	12 weeks	-	-
Anandavadivelan P. (2023)[12]	134 (64/70)	Physical activity+strengthening	Post-surgery	Home program	12 weeks	Yes	Yes
Wen L. (2023)[13]	75 (36/39)	Baduanjin (Qigong)	Post-surgery	Supervised	12 weeks	Yes	-
Allen SK. (2022)[14]	54 (26/28)	Aerobic+resistance+stretching	During chemotherapy	Supervised+home program	15 weeks	Yes	-
Yin Lin K. (2021)[15]	40 (20/20)	Aerobic+resistance+stretching	Post-surgery	Supervised	8 weeks	Yes	-
Hu Q. (2020)[16]	132 (67/65)	Resistance	Post-surgery	Supervised	12 weeks	Yes	Yes
Thomas A. (2020)[17]	46 (21/25)	ROM+NMES	Post-surgery	Supervised	10 days	No	No
Simonsen C. (2020)[18]	26 (12/14)	Aerobic+resistance	Post-surgery	Supervised	12 weeks	-	-
Lavigne C. (2020)[19]	22 (11/11)	Resistance+NMES	Post-surgery	Supervised	12 weeks	-	-
Jui Yen C. (2019)[20]	72 (38/34)	Aerobic+resistance (NMES)	Post-surgery	Supervised	8 weeks	Yes	-
Samuel SR. (2019)[21]	120 (62/58)	Aerobic+resistance	Post-surgery	Supervised	11 weeks	-	Yes

CT: Chemotherapy, RT: Radiotherapy, -: There is no information, ROM: Range of motion, NMES: Neuro-muscular electrical stimulation

changes in fatigue levels and overall quality of life in the exercise group.

In a study conducted by Lavigne et al.,[19] only resistance exercise programs aided by NMES were performed, and the results were analyzed. In other studies, a portion of the exercise program was dedicated to resistance exercises. The exercise programs were conducted 2 to 5 days per week (average 2.75 days), with each session consisting of 1 to 3 sets (average 2.22 sets) and 8 to 20 repetitions (average 11.89 repetitions). In one study,[11] resistance was based on 15 repetition maximum, in four studies[12,14,15,20] exercise bands were used, in one study [16] an exercise station was utilized, and in two studies[17,19] NMES was used.

Stretching Exercises

In two studies, it was noted that stretching exercises were performed before resistance exercises.[14,15]Although the exact type and intensity of the exercises were not specified, it was reported that stretching exercises were done in place of warm-up and cool-down periods. In other studies, stretching exercises were either not mentioned or were used in cases of reduced range of motion.

Qi-gong Exercises

In a study conducted by Wen L. et al.,[13] Qi-gong exercises were administered to patients with HNC, and the results were examined. In the 12-week exercise training program, participants were given an exercise regimen for 5 days a week, with each session lasting a total of 40 minutes. The program was followed up as a home exercise program via video conference. At the end of the study, significant improvements were noted in the quality of life, sleep quality, and cancer-related fatigue of the HNC patients.

DISCUSSION

It is noted that there are a limited number of exercise studies in HNC. Aerobic and resistance exercises have been most frequently applied. The majority of these studies focus on chemotherapy, effectively demonstrating the role of exercise in reducing the side effects of chemotherapy. In the last five years, studies involving exercise applications in HNC have generally focused on esophageal cancer. This is thought to be due to the frequent use of chemotherapy in this patient group and the significant systemic challenges it poses, increasing the need for physiotherapy.

In addition to physical benefits, exercise-based rehabilitation programs have been shown to enhance the overall quality of life for HNC patients. Structured exercise programs, such as those including aerobic and resistance exercises,[14,15,18,20,21] have been effective in preventing the deterioration of fatigue and significantly improving quality of life.

The duration of these interventions varied from 8 to 15 weeks, with sessions conducted 2 to 5 times per week, indicating a structured and intensive approach to rehabilitation. This structured approach ensures that patients receive consistent and frequent exercise sessions, which are critical for maximizing the benefits of the rehabilitation process. Interventions lasting 8 weeks might be more suitable for patients who require shorter, high-intensity programs, possibly due to the severity of their symptoms or the need for quick recovery. On the other hand, interventions extending to 15 weeks provide patients with prolonged and steady rehabilitation, helping them gradually rebuild strength and endurance without overwhelming their systems.

The frequency of 2 to 5 sessions per week offers scheduling flexibility, accommodating patients' other treatment plans and personal commitments. Conducting sessions regularly, with moderate to high frequency, ensures ongoing progress and adaptation, which are crucial for enhancing physical function and alleviating the side effects of cancer treatments. The variation in both duration and frequency allows for personalization according to individual patient needs and capacities, achieving a balance between intensity and recovery.

The concentration of studies after surgery emphasizes the importance of exercise therapy in the recovery process. All studies indicate that exercise should be included in the treatment program of patients diagnosed with HNC. To avoid incorrect applications, most studies have utilized supervised exercise. This has led to more effective implementation of exercise training and more striking results. However, to determine changes in groups where supervised exercise cannot be performed, there is a need for studies involving exercise groups followed by home programs and telerehabilitation, with results compared to those of supervised exercise groups.

CONCLUSION

This review clearly demonstrates the significant role of exercise in the rehabilitation of HNC patients. The reviewed studies highlight that supervised aerobic and resistance exercises, particularly during chemotherapy, are effective in reducing side effects and improving overall quality of life. However, HNC encompass a variety of cancer groups, resulting in differences in the applied medical treatments. Future studies should include exercise interventions post-surgery acute phase and radiotherapy. In conclusion, enhancing the treatment programs of HNC patients with exercise interventions is crucial to improving their recovery.

ETHICAL DECLARATIONS

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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